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EDITOR'S DESK

We are pleased to present this year's second issue. Guest-edited by Professor Vasant Natarajan and Professor Vijay B. Shenoy who are at the Department of Physics at the Indian Institute of Science, this issue is devoted to the topic of "Cold Atom Quantum Emulators: From Condensed Matter to Field Theory to Optical Clocks."

Insights from atomic-molecular-optical physics have led exciting developments in the use of cold atoms to produce experimental realizations of model Hamiltonians. As the guest editors put it, this opens up possibilities which are the "dream of every physicist." The editorial board is grateful to Prof. Natarajan and Prof. Shenoy for putting together this issue with five critical reviews covering aspects of this field from atom lithography to non-equilibrium physics of bosons.

As I mentioned in a previous editorial comment, this year is "very, very special" as the Journal celebrates its Centenary. A commemorative volume will be published to mark this major landmark, and it should reach you within the next few months.

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GUEST EDITOR'S DESK

Cold Atom Quantum Emulators: From Condensed Matter to Field Theory to Optical Clocks

Emulation of quantum many body systems using cold atoms is one of the fastest growing fields of physics. Drawing from the vast experience and knowhow from atomic-molecular-optical (AMO) physics, this field promises not only the resolution of many long standing puzzles in condensed matter/high energy physics, but also provides new opportunities to realize quantum states that cannot be realized in conventional systems such as materials. The overall idea of the cold-atom quantum emulation is to use a system of atoms (fermions, bosons, or even mixtures of the two) whose Hamiltonian can be designed by techniques developed in the last three decades. In other words, cold atoms possibilities of realizing tailor-made Hamiltonians—a dream of every physicist!

This issue of the Journal focuses on quantum emulation with cold atoms. The first article on atom lithography discusses the two kinds of light forces on atoms. The remaining articles discuss physics of impurities in fermi gases, non-equilibrium physics of bosons, new bosonic phases such as the chiral Mott insulator, and fermions and bosons in synthetic gauge fields. These topics will provide an overview of the vast possibilities of cold atoms, particularly in realizing new quantum states of matter both in equilibrium and non-equilibrium.

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